

What is claimed is:

1. A method for forming a glass body, the method comprising:

providing a glass aggregate;

5 mixing the glass aggregate with a liquid to form a slurry;

casting the slurry in a mold to form a porous pre-form, the mold including a porous glass substrate; and

consolidating the porous pre-form into the glass body.

10 2. The method of claim 1, wherein the step of providing the glass aggregate includes forming soot particles as a by-product of a flame hydrolysis process.

3. The method of claim 1, wherein the step of providing glass aggregate further comprises:

forming soot particles as a by-product of a flame hydrolysis process;

15 providing a coarse glass powder having the same composition as the soot particles, the coarse glass powder including glass particles that are, on average, larger than the soot particles; and

mixing the soot particles and the coarse glass powder.

20 4. The method of claim 1, further comprising the step of cleaning the porous pre-form to remove impurities.

5. The method of claim 4, wherein the porous pre-form is cleaned by applying a liquid or a gas while the pre-form is in the mold.

25 6. The method of claim 4, wherein the step of cleaning further comprises:

disposing the porous pre-form in a high temperature chlorine gas atmosphere, the high temperature being lower than a sintering temperature; and

30 treating the porous pre-form by allowing the chlorine gas to react with the impurities for a pre-determined time.

7. The method of claim 5, wherein the high temperature is between 700°C and 1100°C.

8. The method of claim 1, wherein the liquid includes ammonia hydroxide.

9. The method of claim 1, wherein the step of drying is performed by heating the porous pre-form to approximately 1000°C.

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10. The method of claim 1, wherein the step of casting comprises the step of providing a mold that includes a glass substrate.

11. The method of claim 1, wherein the step of casting includes pressure casting the slurry.

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12. The method of claim 11, wherein the step of pressure casting the slurry further comprises:
disposing the slurry in a mold apparatus, the mold apparatus including a mold and a water collection chamber;
adding a desiccant to the slurry; and
applying a vacuum to the slurry, the vacuum and desiccant acting in concert to transfer water from the mold to the water collection chamber.

13. The method of claim 1, wherein the step of consolidating includes heating the porous pre-form to a temperature of 1600°C.

14. The method of claim 13, wherein the step of consolidating includes heating the porous pre-form to a temperature of 1600°C for approximately ten minutes.

15. The method of claim 1, wherein the step of heating includes sintering the porous pre-form.

16. The method of claim 15, wherein the step of sintering the porous pre-form is performed at a temperature above 1000°C.

17. The method of claim 15, wherein the porous pre-form is sintered at a temperature of approximately 1400°C.

18. The method of claim 15, wherein the porous pre-form is sintered at a temperature of approximately 1500°C.

5 19. The method of claim 15, wherein the porous pre-form is sintered at a temperature of approximately 1650°C.

20. The method of claim 15, wherein the step of sintering further comprises:

disposing the porous pre-form in a high temperature chlorine gas atmosphere; the high temperature being lower than a sintering temperature; and

10 treating the porous pre-form by allowing the chlorine gas to react with the impurities for a pre-determined time.

21. The method of claim 15, wherein the step of sintering is performed in a substantial vacuum.

22. The method of claim 15, wherein the step of sintering is performed in a helium atmosphere.

23. The method of claim 1, wherein the glass substrate is of the same composition as the glass aggregate.

24. The method of claim 1, wherein the glass aggregate includes glass soot, glass cullet, and glass pieces larger than the glass cullet;

25 25. The method of claim 1, wherein the step of casting is performed using a slip casting technique.

26. The method of claim 1, wherein the step of casting is performed using a vacuum casting technique.

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27. The method of claim 1, wherein the step of casting is performed using a gel casting technique.

28. A method for forming a glass body, the method comprising:

providing a glass aggregate;
mixing the glass aggregate with a liquid to form a slurry;
pressure casting the slurry in a mold to form a porous pre-form; and
heating the porous pre-form to form a glass object.

29. A method for forming a glass body, the method comprising:

providing glass particles, the particles including relatively fine glass soot particles
mixed with relatively coarse glass particles;
mixing the glass particles with a liquid to form a slurry;
pressure casting the slurry in a mold to form a porous pre-form; and
heating the porous pre-form to form a glass object.

30. A method for forming a glass body, the method comprising:

providing glass particles, the particles including relatively fine glass soot particles
mixed with relatively coarse glass particles;
mixing the glass particles with a liquid to form a slurry;
providing a mold having a porous glass substrate;
pressure casting the slurry in the mold to form a porous pre-form; and
consolidating the porous pre-form to form a glass object.

31. The method of claim 30, wherein the mold is formed from glass soot particles as a by-product of a flame hydrolysis process, the glass soot particles being collected in a containment vessel to form a body, the body being partially sintered to form a least a portion of the mold.

32. A method for forming a glass body, the method comprising:

providing a glass aggregate;
mixing the glass aggregate with a liquid to form a slurry;
pressure casting the slurry in a mold to form a porous pre-form;
disposing the porous pre-form in a chlorine gas atmosphere heated to a predetermined temperature, the chlorine gas reacting with the impurities for a pre-determined

time, whereby the impurities are vaporized and carried out of the porous pre-form; and
consolidating the porous pre-form to form a glass object.

5 33. The method of claim 32, wherein the step of consolidating includes heating the porous pre-form.

34. The method of claim 33, wherein heating the porous pre-form includes sintering the porous pre-form.

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35. The method of claim 32, wherein the predetermined temperature is lower than a sintering temperature

36. A method for forming a glass body, the method comprising:

providing a glass particles, the particles including relatively fine glass soot particles

mixed with relatively coarse glass particles;

mixing the glass particles with a liquid to form a slurry;

pressure casting the slurry in a mold to form a porous pre-form;

disposing the porous pre-form in a chlorine gas atmosphere heated to a predetermined

temperature, the chlorine gas reacting with the impurities for a pre-determined

time, whereby the impurities are vaporized and carried out of the porous pre-form; and

consolidating the porous pre-form to form a glass object.

25 37. The method of claim 36, wherein the step of consolidating includes heating the porous pre-form.

38. The method of claim 37, wherein heating the porous pre-form includes sintering the porous pre-form.

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39. The method of claim 36, wherein the predetermined temperature is lower than a sintering temperature

40. A method for forming a glass body, the method comprising:

providing a glass aggregate;

mixing the glass aggregate with a liquid to form a slurry;

casting the slurry in a mold to form a porous pre-form, the mold including a porous

glass substrate having the same composition as the glass aggregate; and

consolidating the porous pre-form into the glass body.

41. A method for forming a glass body, the method comprising:

forming soot particles as a by-product of a flame hydrolysis process;

mixing the soot particles with a liquid to form a slurry;

disposing coarse glass cullet in a mold;

vacuum casting the slurry in a mold to form a porous pre-form, the mold including a

porous glass substrate; and

consolidating the porous pre-form into the glass body.

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